

Looking Beyond Time and Cost Influences in Megaprojects

ABSTRACT

In the popular press, coverage of megaproject tends to be dominated by time and cost issues without consideration of other critical project factors. Those taking a more holistic approach have also analysed the wide variety of megaproject characteristics, which may negatively impact on successful delivery. While megaprojects are considered temporary or unique collaborations, it is increasingly common to see recurring themes within megaproject delivery. These include high levels of risk, environmental concerns, leadership challenges, stakeholder commitment, ecological aspects, and cultural challenges, all of which influence whether a megaproject will be - or will not be considered as - success or failure. This paper discusses which are the most commonly identified characteristics related to a megaproject's success, beyond the widely covered time and cost criteria.

Work over the last decade which has identified the characteristics which are found to exist in specific megaprojects is reviewed, and these findings are thematically analysed to provide a more holistic understanding of the complexities involved in executing megaprojects. Work by others identifies critical characteristics such as strong leadership, risk management, organisational culture, national culture, political and environmental issues, and explores new and emerging directions updating the perception of megaprojects. The inherent intricate inter-relationship of these characteristics is identified, and how these interrelationships add to the complexities of governing such ambitious ventures is discussed. This research finds that although time and cost considerations tend to dominate popular press headlines, the enormity and complexity of many of these ventures makes it increasingly critical to give attention to and articulate other characteristics including risk, culture, stakeholder and management aspects.

Key Words: Megaproject Characteristics; Megaproject Cost Risk; Megaproject Execution.

1 COST DOMINANCE IN MEGAPROJECTS

Megaprojects were frequently defined by reference to the capital cost of the project - in the United States, a project costing greater than one billion US dollars was generally taken to be a 'mega-project' (Capka, 2004). Many countries have since adopted the practice, of using a monetary value of one billion of their currency as the defining factor. Countries include Hong Kong one billion dollars (Mok, Shen, & Yang, 2015); the UK one billion pounds (Flyvberg, 2017) and European projects of one billion euros (Pau, Langeland, & Njå, 2016).

The commercial scale and value of megaprojects frequently draws significant public focus, both positive and negative, and often causes controversy. This global phenomenon includes megaprojects such as Britain's HS2 high-speed railway (Transcity Rail, 2019) accused by some of being a white elephant; Mexico's suspended proposed 'Mexico City Airport' new airport (Reuters, 2018); or Ethiopia's delayed 'Grand Ethiopian Renaissance Dam' new dam (GCR, 2018). The benefits delivered by megaprojects are often complex to define and value

(assuming they do exist) and therefore attract public scrutiny. The scale of megaprojects has outgrown the original one billion benchmarks, with megaprojects including Dubai's International Airport, Hong Kong Airport or the Panama Canal having such a profound impact on the countries prosperity, that they influence the country's GDP (Flyvbjerg, 2017; McKinsey, 2015; Mellow, 1988). As costs are subject to inflationary pressures and megaproject scope continues to expand, researchers now consider augmented titles, such as the existence of 'Giga' projects and 'Tera' projects (Flyvbjerg, 2014). Researchers also refer to a new variety of enhanced or complex megaprojects (Hillson, 2018) with their increasing scale and scope, often making them essential to the local and global economy. This focus on cost overruns has also resulted in the formation of a pan-European working group to discover if megaprojects can be designed more effectively and less costly throughout the European Union (www.mega-project.eu). Flyvbjerg is widely associated with research associated with cost overruns in megaprojects and promotes an 'Iron Law of Megaprojects' (Flyvbjerg, 2018). In November 2018, he addressed the Public Administration and Constitutional Affairs Committee in the British House of Commons to explain what he meant by an 'iron law' and the implications of this. Flyvbjerg's research indicates that megaprojects are 'over budget, over time, under benefits, over and over again' (Flyvbjerg, 2018). He later qualified this statement to indicate that they were within budget once in every ten occasions.

Flyvbjerg has been criticised for failing to consider broader impacts such as the social, economic and political spectrum (Room, 2018). Love & Ahiaga-Dagbui, (2017) suggest that the overemphasis concerning megaproject cost overruns 'have fooled many people with their creative and rather convincing narratives that sensationalise the causes of cost overrun in transportation projects', at the expense of considering other characteristics. His work has also been criticised for strategic misrepresentation in the financial analysis of projects which fell below the one billion marks, a lack of scrutiny of the data used to produce the quantitative statements and the lack of a universal standard or comparison for cost measurement (Love & Ahiaga-Dagbui, 2018, p. 5,11,15,19). He is accused of sensationalising financial data through cherry-picking results (Love & Ahiaga-Dagbui, 2018), and using provocative and memorable titles to publicise his theories (Siemiatycki, 2018a). Flyvbjerg, on the other hand, condemns his critics for an alleged inability to use statistics (Flyvbjerg et al., 2019). A paper titled 'Underestimating Costs in Public Works Contracts: Errors or Lie? (Flyvbjerg, Holm, & Buhl, 2002), is also credited with directing criticisms of megaprojects away from technical explanations, to a primary focus on costs (Siemiatycki, 2018b, p. 364). Others suggest that labelling a megaproject cost increase as 'overbudget', by merely comparing the starting and final expenses, may not be an accurate assessment, as one may be comparing different scopes of works - the proverbial comparing of apples and oranges (Walsh & Walker, 2019).

This paper suggests that there is a danger that preoccupation with time and cost characteristics of megaprojects, reduces focus and appropriate consideration of the other multitude of complexities associated with these extremely challenging ventures. Work by others has shown that other critical factors can have a significant impact on megaprojects success or failure. These include factors such as public accountability, stakeholders management, control of the enormous levels of risk, organisational and leadership challenges, and the complexities of dealing with multi-cultural leadership, all of which can be as challenging as managing cost (Li & Guo, 2011; Pollack, Biesenthal, Sankaran, & Clegg, 2018a). Experience and history suggest that a significant number of these issues, such as multi-cultural and leadership risks, do not receive enough consideration until it becomes too late to control their impacts

2. Research Methodology

A literature review was performed on-line following search recommendations identified by O Dochartaigh (2012) using keywords associated with megaprojects and their characteristics, in May 2019. The search considers peer-reviewed journals, PhD thesis and published works. The search suggests that research concerning megaprojects has evolved over the last decade, from an initial focus on solo considerations such as cost or time overruns to a broader identification of megaproject characteristics. Studies which identify megaproject characteristics are shown in Table 1. These characteristics were mapped, and the arising themes were thematically analysed (Braun & Clarke, 2006), synthesised and tabulated, before all components related to time or cost were removed. The thematic analysis for megaproject characteristics excluding time and cost is provided as Figure 2.

2 EXCLUSION OF TIME & COST RELATED ISSUES

Research by Irimia-Diéguez, Sanchez-Cazorla, & Alfalla-Luque, (2014) found that time and costs risks were identified as critical megaproject risks in 42% of relevant publications. While this percentile demonstrates the importance of time and costs in megaproject research, the remaining components (58%), merit equal or more investigation and focus. Megaprojects are typically described as large-scale, complex ventures costing a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people (Davies, Dodgson, Gann, & Macaulay, 2017; Flyvberg, 2017; Mok et al., 2015; Pollack et al., 2018a; Turner, 2018). When gauging the success or failure of megaprojects, it is essential to examine all complexities and characteristics associated with megaprojects, such as the achievement of all defined goals or objectives (Garemo, Matzinger, & Palter, 2015; Pollack et al., 2018a; Söderlund et al., 2017). Many researchers now concentrate on analysing the characteristics (or challenges) associated with megaprojects. Recent research includes Eweje, Turner and Müller, (2012); Mišić and Radujković, (2015); Pollack, (2018); Garemo, Matzinger and Palter, (2015) and Flyvberg (2017). This focus of researchers attempts to provide a more balanced and holistic approach to the management of these so-called ‘wild beasts’ (Zidane, Johansen, & Ekambaram, 2013). Key megaproject characteristics are identified in Table1 below:

Year	Focus of Research	Characteristics Identified	Nr
2012	Maximising strategic value from megaprojects -Eweje, Turner and Müller, (2012)	Conflict management; Government Influence; Community management; JV management; HSE Issues; location issues; project governance; local policies; core team; multicultural leadership	10
2013	Megaprojects - Challenges and Lessons Learned (Zidane et al., 2013)	Size; Cost; time; success; complexity; Singularity; Stakeholders; Uncertainty; Implementation Owner; Knowledge	11
2015	Megaprojects: The good, the bad, and the better - McKinsey & Company (Garemo et al., 2015)	Overoptimization and overcomplexity, poor execution and weakness in organisational design and capabilities	3

2015	Critical drivers of megaprojects success and failure - Mišić and Radujković, (2015)	Legal; Risk: Political; Leadership	4
2016	Assessing Cultural Influences in Megaproject Practices Pau, Langeland and Njå, (2016)	Charismatic Leadership; concept incubation; endorsement; governance; Team culture; Staffing; Communication; Control; Accountability; Failure Fines; Risk; politics; Values; Stakeholder management; Ability to Change; Environment.	16
2017	The Oxford Handbook of Megaproject Management - Flyvbjerg, (2017b)	Inherently Risk; Frequently Weak leadership; Multiple stakeholders; Unique projects; Over-commitment at initial stages; Optimism bias (financially); Scope change; “Black Swan” effect (extreme events massively adverse outcomes); Inadequate cost & time contingencies and; Results - cost overruns, delays and benefits shortfalls.	10
2018	Applying Institutional Theories to Managing Megaprojects (Biesenthal, Clegg, Mahalingam, & Sankaran, 2018, p. 45)	Reach; duration; Cost; risk and uncertainties wide, desperate actors; Arenas of controversy; Legal and regulatory issues; Value destruction	8
2018	Megaprojects redefined – complexity vs cost and social imperatives (Pitsis, Clegg, Freeder, Sankaran, & Burdon, 2018)	Size; Cost; Uniqueness; Schedule; Scope; Governance; Stakeholders; Complexity; Risk; Value Optimisation	10

Table 1- Identified Megaproject Characteristics

3 CHARACTERISTICS - GENERAL TRAITS

The characteristics identified in Table 1 indicate a wide range of megaproject influencers beyond time and cost considerations. For this paper, value is also considered as a cost, and in this research, context value can be considered as benefits over and above the actual price. Such calculations recognise that megaprojects may be seen as financial failures, yet perceived by the public as a success, such as the UK-France Channel Tunnel or the Sydney Opera house (Flyvbjerg, 2018). Figure 1 describes some of the other characteristics which influence the execution of a megaproject. These include cultural impact, high levels of risk, management complexity, political influence, inherent complexity, and the presence of multiple stakeholders. This paper proposes a shift from the dominance of time and cost considerations, to a more holistic approach recognising

all the major relevant characteristics. In this paper, we acknowledge that megaprojects are often bespoke ventures and that a universal set of attributes does not exist. Supranational, geographical and national and cultural impacts are also factors impacting the execution of megaprojects. The paper reviews the effect of some of the more common characteristics identified by recent research, including stakeholder impact, leadership and risk. These characteristics are by no means a representation of the full extent of symptoms that each bespoke megaproject is likely to exhibit, but serves as a demonstration of the pressures a megaprojects faces, the successful execution of which, has been described as the autonomy of ambition (Flyvbjerg, Bruzelius, & Rothengatter, 2003).

The Uniqueness and Temporariness of Megaprojects

Research has identified the characteristic of the ‘temporariness’ of megaprojects, which in turn makes collaboration critical, challenging and demanding, frequently resulting in underperformance or failure of the megaproject (van Marrewijk, Ybema, Smits, Clegg, & Pitsis, 2016, p. 1750). Megaprojects are paradoxically sometimes considered as short-term ventures, often limited to a single special-purpose delivery vehicle. An unusually long allegiance would, for example, be the megaproject to build China’s South-to-North Water Diversion Project (Economist, 2018) which has a programme spanning five decades. The unique nature of many of these projects is acknowledged, and they are often accepted as ‘temporary endeavours’ (Brookes, Sage, Dainty, Locatelli, & Whyte, 2017), exhibiting unique temporal characteristics such as task complexity, singularity and innovativeness (Sydow, 2017). While some of these characteristics are intertwined, and some are of a unique design, there are repeated characteristics, such as risk or leadership issues, which often feature in the meta-analysis of megaproject characteristics. A recent longitudinal study of the expansion of Heathrow Airport’s T2 terminal, the Olympic Village and Crossrail suggests that megaproject underperformances are not cost-related, but instead due to inadequate organisational structural development (Perspective, Lundrigan, & Gil, 2015). The complexities of organising megaprojects and their complex structures promote their consideration as ‘collaborative developments of one-off indivisible structures under pressure’ (Perspective et al., 2015, p. 32).

Research has shown that other critical factors related to megaprojects such as public accountability, the complications in managing stakeholders, the volume of risk associated with delivery, organisational and leadership challenges, the complexities of dealing with multi-cultural leadership or in some cases the megaprojects impact on the nations GDP, can be as challenging as financial constraints (Li & Guo, 2011; Pollack et al., 2018a). If these broader issues do not receive enough consideration in a timely fashion, it can become too late to control their impacts. This paper briefly examines the potential influences of three identified characteristics: leadership challenges, risk containment and stakeholder forces.

4 LEADERSHIP CHALLENGES IN MEGAPROJECTS

The leadership of a megaproject requires the project leader to demonstrate strong business acumen, a high level of experience in the construction industry, and specific knowledge of delivering megaprojects. The project leader often needs to show specific skills in a particular type of project, and typically the Project Sponsor will mandate a list of critical personal and project-specific criteria to ‘headhunt’ appropriate people they require, to increase the chance of successful project delivery. These criteria depend on the project’s requirement, social,

political and regional needs. Such standards are well established for megaprojects in the Gulf Community Council, in the Middle East, which is a megaproject hotbed with over 200 on-going megaprojects (Walsh & Walker, 2019).

The criteria for selecting project directors to lead megaprojects typically include high experience and education entry barriers; usually, the job specification requires a Master's Degree in Engineering or related technical field, in conjunction with a broad technical and construction background and registration with a professional body. It is generally also required that the project director can demonstrate at least 20 years' experience in large-scale complex programs in a senior management capacity. These requirements are perceived to be needed as megaprojects are often unconventional projects, which require exceptional management and leadership skills. In Fryberg's words (2014), if the project leader of a conventional project involves the equivalent of a driver's license to do what they do then managers of megaprojects need a pilot's jumbo jet license (Flyvbjerg, 2014). In addition to professional and field-related experiences, it is suggested that megaproject delivery requires a healthy spirit of collaboration as a prerequisite factor for megaproject success (Kardes, Ozturk, Cavusgil, & Cavusgil, 2013a)

Biesenthal et al. (2018); Smits & Brownlow (2017); van den Ende & van Marrewijk, (2015) interrogated the performance of existing megaprojects and identified that cultural issues amongst the management team leadership and governance were a critical risk that requires special considerations and management during the lifecycle of the megaproject. Mišić & Radujković, (2015b) researched factors contributing to megaproject success or failure and suggested that culture is a critical driver for the successful completion of megaprojects. They asserted that cohesive group performance of the delivery team is essential to its success. Zein (2016) describes how the unique combination of cultures gives rise to potential tensions within the organisation, describing this combination of cultures as a 'cultural soup'. Struggles & Heindrick (2015) highlight the need for leadership of such culturally diverse groups to integrate and unite teams associated megaprojects.

5 RISKS INHERENT IN MEGAPROJECTS

There are multiple sources of megaproject risk including complexity, culture, political and governance (see for example Irimia-Diéguez, Sanchez-Cazorla, & Alfalla-Luque, 2014a; Kardes, Ozturk, Cavusgil, & Cavusgil, 2013b; Pollack et al., 2018a; van Marrewijk, Clegg, Pitsis, & Veenswijk, 2008). When considering megaproject risk, the uniqueness of each endeavour results in a need to tailor the risk register to the particular megaproject's attributes. Kardes et al. (2013b) suggest categorising these risks as a technical and operational risk; market risk, and institutional and social risks). A pan-European group of researchers, the COST Working Group, reviewed publications which identify risk in megaprojects (COST Working Group, 2015) and this identified 39 specific megaproject risk related publications from the International Journal of Project Management; the Project Management Journal and the International Journal of Managing Projects in Business. The 39 papers include research focused on sustainability (1 article), governance (11 articles); complexity (10 articles) and stakeholders (17 articles).

Complexity is often associated with the bespoke and complex nature of the projects, and, this paper briefly reviews this together with issues relating to megaproject governance and stakeholder management. These are only some of the potential risks potentially impacting on each megaproject. Other hazards include the management of social, political, and economic risk, and the difficulties of achieving social congruence within the project team, both of which

are considered vital leadership challenges (Kardes et al., 2013a). There are further difficulties associated with identifying social responsibility or political risks, as they are often emotional and intangible, and therefore cannot always be easily quantified (Dyer, 2017, p. 341). Merron (1988) describes how megaproject should be considered as *large bundles of risk compounded at every corner, including political, financial, time and culture*.

6 STAKEHOLDER INFLUENCES IN MEGAPROJECTS

Given their scale and complexity, there are always multiple stakeholders in megaprojects, and these stakeholders inevitably prioritise their group interests, which can lead to a lack of stakeholder congruence. Stakeholders include the project sponsor, funding bodies, contractors, and project managers, together with their project teams and employers. It is suggested that stakeholders can be ranked by significance depending on their *position to exercise power within the context of a project* (Hillson, 2016,p.2).

The role of the initiating project stakeholder (or sponsor) is crucial. It is suggested that many megaprojects are initiated based on a strategic *politically convenient* misrepresentation of initial costs, as embedded in Hirschman's hiding hand principle (Flyvbjerg, 2016). These principles involve unrealistic optimism involving an overestimation of potential project benefits and exaggeration of project success, alongside an underestimation of projects costs (Ika, 2018). Flyvbjerg, (2014) describes this as a political *sublime* whereby megaprojects act as monuments to the supportive politician, providing political exposure which helps a politician's re-election chances (assuming the project is perceived or portrayed as a success). Other significant stakeholders include but are not limited to, funders, shareholders, government bodies, and a long list of project-driven stakeholders. Public stakeholders such as environmentalists or climate change activists can delay or defer the execution of megaprojects. For specific megaprojects, such as infrastructure developments, the volume of potentially impacted stakeholders is vast and includes the general public, advisory and public bodies, government, affected communities, and individuals (Erkul, Yitmen, & Çelik, 2016). The identification of stakeholders can be far-reaching, for example for Gazprom's 4000 km Siberian power pipeline; the projects managers took into account the need to consider its social responsibilities to respect the risks associated with the disruptions to reindeer hunters (Sidortsov, Ivanova, & Stammner, 2016, p. 65). It is also a suggested that there is a responsibility to consider the whole project lifecycle, to reflect the wellbeing of society as a stakeholder (Ma, Zeng, Lin, Chen, & Shi, 2017). The far-reaching influences of megaprojects need to be considered, its stakeholders prioritised, and their significance ranked in terms of the megaprojects needs.

7.0 CONCLUSIONS

Megaproject characteristics beyond time and cost include a wide range of unique features, the more prominent of which can be categorised and represented in the table below:

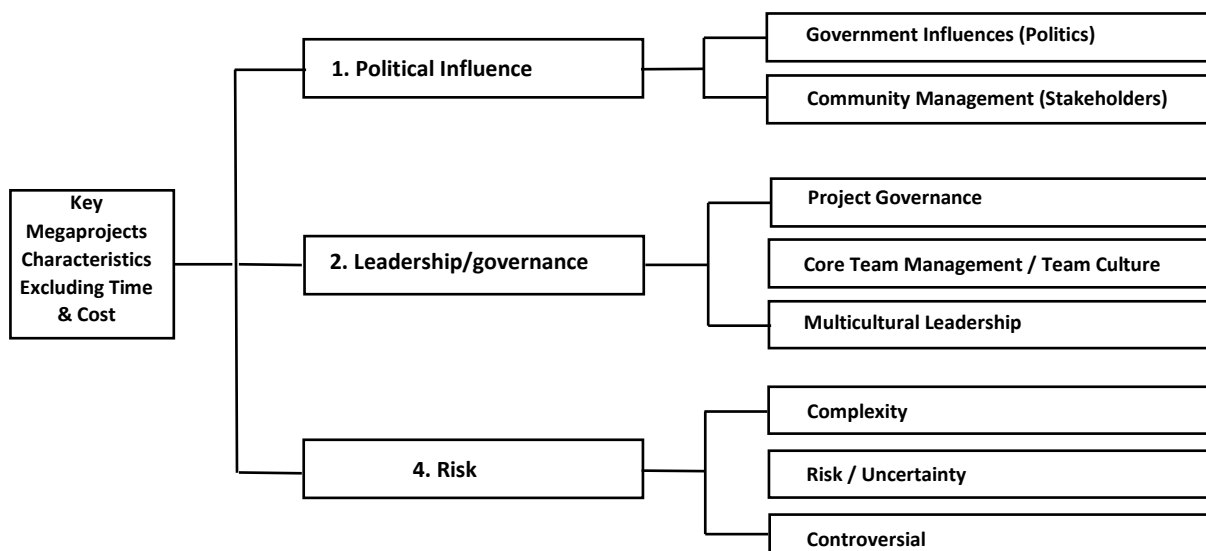


Figure 2 – Synthesis of Megaproject Characteristics

This paper acknowledges both the criticality and importance of Time and Cost factors as crucial considerations in the execution of megaprojects. Where the project is funded in part or wholly by the taxpayer, public accountability makes this to the focus of the popular press. Despite time and cost considerations capturing attention in this way, those involved in the management and execution of these megaprojects should also consider the other critical megaproject characteristics, including governance issues, a multitude of project risks and the role and influence of the many and diverse stakeholders. As each megaproject's unique, each must be individually examined at the outset, and each potential risk mapped to provide the best potential to succeed. It is suggested that coverage of megaprojects in the popular press will continue to be dominated by a focus on cost and time overruns until the more extensive project risks set out in this paper are identified, understood, and more clearly articulated both within the project team and to the wider stakeholders.

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